DATA HIDING IN MEDICAL IMAGES USING ENCRYPTION AND STEGANOGRAPHY TECHNIQUES

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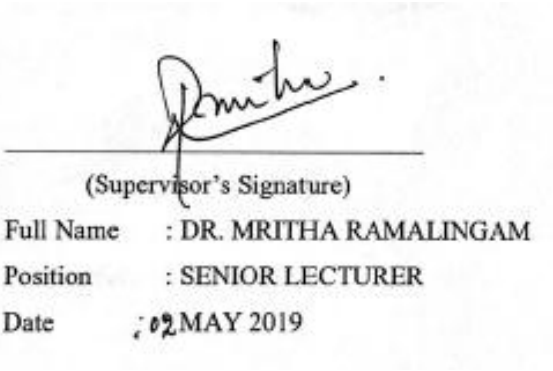
SUPERVISOR'S DECLARATION

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Bachelor of Computer Science (Computer Systems and Networking).



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STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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Thesis submitted in fulfillment of the requirements
for the award of the degree of
Bachelor of Computer Science (Computer System & Networking)

Faculty of Computer System & Software Engineering

UNIVERSITI MALAYSIA PAHANG

MAY 2019

ACKNOWLEDGEMENTS

Alhamdulillah, I am grateful to Allah for the good health and well-being that were necessary to complete this thesis. First and foremost, I wish to express my heartfelt gratitude to my supervisor, Dr. Mritha Ramalingam. You have been a brilliant mentor for me. I would like to thank you for your never ending support during my tenure as research student under your supervision. My research path could be difficult without your insightful comments and suggestions. I am eternally grateful to have her as an advisor.

A special thanks to my family. Words cannot express how grateful I am to my family for their love and support throughout these years. Your prayer for me was that sustained me thus far. I owe everything to them.

ABSTRAK

Tesis ini membawakan penghantaran imej perubatan melalui Internet. Algoritma yang dibentangkan akan digunakan pada data perubatan. Tesis ini membentangkan kaedah yang menggabungkan teknik enkripsi, steganografi dan kompresi untuk tujuan penghantaran data. Dalam penyelidikan ini, bagi pihak penghantar, teks akan dienkripsi dengan algoritma "Advanced Encyrption Standard" dan disembunyikan di dalam imej yang diterapkan menggunakan algoritma ''Least Significant Bit'' untuk meningkatkan keselamatan. Imej-stego akan terhasil dan kemudian dimampatkan dengan menggunakan mampatan "Discrete Cosine Transform" untuk mengurangkan saiz imej bagi mengurangkan simpanan di dalam fail. Di sisi penerima, kaedah songsang akan dilaksanakan dalam arah terbalik untuk mendapatkan teks rahsia dan imej. Applikasi simulasi MATLAB akan diliputi dalam kajian ini untuk mengendalikan teknik yang dipilih dan juga untuk pembangunan selanjutnya. Pada akhir kajian ini, prestasi algoritma akan dinilai dalam aspek ralat min kuasa dan nisbah "peak signal noise ratio" untuk membandingkan keputusan kaedah yang dipilih.

ABSTRACT

This paper presents securing the transmission of medical images over the Internet. The presented algorithms will be applied to medical data. This work presents a method that combines encryption, steganography and compression techniques for data transmission purpose. In this paper, for the sender side, the secret text will be encrypted using Advanced Encryption Standard algorithm and embedded into the chosen cover image using Least Significant Bit algorithm for more security. A stego-image will be generated and compressed using Discrete Cosine Transform to reduce the size of stego-image in order to save storage. In the receiver side, the inverse methods will be implemented in reverse order to get the cover image along with the secret text. MATLAB simulation tool is used to implement the chosen technique and also for further development. In the end of this research, the performance of the algorithm will be assessed in the aspect of mean square error and peak signal noise ratio to compare the results of the chosen method.

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LIST OF ABBREVIATIONS

AES	Advanced Encryption Standard
LSB	Least Significant Bit
DCT	Discrete Cosine Transform
DWT	Discrete Wavelet Transform
MSE	Mean Square Error
PSNR	Peak-Signal-to-Noise-Ratio

CHAPTER 1

INTRODUCTION

1.1 Introduction

Security is the condition of being free from danger or risk. In the hospital, the medical data of patients that are recorded should not be disclosed to anyone as it is a sensitive data. Such medical data includes patient information, treatment information and medical images. With the recent improvements in the technology, it makes it easier to access and handle the medical data from remote database, however the challenges in the medical data privacy arise and it should be pay heed to.

In medical environment, the demand for quick and secure transmission intensify. Medical images transmission is a daily routine and it is necessary to have an efficient process in order to transmit them securely over the Internet. Example of medical images includes X-rays, computed tomography(CT), and magnetic resonance imaging(MRI). Thus, security in medical images is vital for patient safety and confidentiality to protect the data from the unauthorized party. For security purpose, encryption and steganography techniques are proposed. A compression technique is also used for the medical images to save storage (Sanjay I. Nipanikar, 2017).

Encryption is the process of encoding an information in such a way that only authorized parties can access it. Encrypting medical records are critical for patient security, however, by applying an encryption technique only, it is still vulnerable to attackers. Another technique is steganography. Steganography will help to improve the security of encryption. It is the process of covering the secret data by hiding the data below the digital cover. Thus, it will not raise any attraction towards the actual secret data as the sender wish to transmit data to received is achieved with favourable result. For compression technique, it is achieved by minimizing the size in bytes of a medical

images without decreasing the images quality to an intolerable degree. By reducing the bytes of a medical images, the chance to store more images in a particular disk or memory space will increase. It will also manage to shorten the time taken from the images to transfer over the Internet.

To provide more security to those who can earn admission to patient medical images, encryption and steganography techniques are utilized together. Firstly, the secret text will be encrypted, followed by steganography technique and lastly, the secret text and cover image will be compress.

1.2 Problem Statement

i. Lack of security. The data in the hospital is protected using cryptography to secure patients' information. Cryptography is the process of hiding the meaning of message by encrypting the message. However, the security of cryptographic systems is not guaranteed as each cryptography algorithm is vulnerable to certain types of attack that will enable intruders a chance to gather patients' information (Al-dmour & Al-ani, 2015).

ii. Medical image are widely used in disease diagnosis. These imaging modalities includes CT, MRI, X radiographs, and etc.. Those modalities provide flexible means for reviewing patient details. However, medical images have large storage requirements. An efficient data compression scheme to reduce the digital data without significant degradation of the medical image is needed.(Yen-Yu Chen & Shen-Chuan Ti, 2012)

1.3 Objective

i. To improve the security in the transmission of medical data by combining encryption and steganography techniques.

ii. To reduce the size of medical data by using data compression technique.

1.4 Scope

i. Limited to medical images only.

ii. Only the person with the steganography key and the intended recipient has authorization.

1.5 Significance

i. Aid to protect confidential medical data from being misused by an unauthorized party.

ii. Improve the security of medical images.

1.6 Thesis Organization

In this thesis, a total of five chapters are composed where each chapter is explained briefly. In Chapter 1, the introduction to the research is discussed. This chapter includes the clarification of the general thesis, the existing problem statement, objectives, scope, significance and overall thesis organization. In Chapter 2, an elaboration on the Literature Review is further explained. The techniques and algorithm that is desirable to be used in the research according to the past system and researches. In Chapter 3, it is Methodology, where explanation on the selected techniques and algorithm which has been used in the development of the research. Chapter 4 will discuss about results and discussion which the main purpose is to document all process involved in the testing that has been done. Lastly, Chapter 5 will contain the summary of research findings.

1.7 Conclusion

In conclusion, this chapter discuss on the introduction of the research work. The introduction section discussed the fundamentals of steganography and encryption. The problem statement has been identified. The introduction is very significant to helps in completing the objective in the near future. There are two objectives that has been identified for this thesis, which are to improve the security in the transmission of medical images with encryption and steganography techniques and to design a data hiding algorithm in medical images with efficient transmission time by using data compression technique.

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